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CLAIMS

Cirvine
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1. An interleaver comprising:

an input polarization beam displacer;

a birefringent filter assembly in optical communication with the input polarization beam displacer, the birefringent filter assembly comprising at least one birefringent filter stage, each birefringent filter stage comprising:

a first filter polarization beam displacer;

a second filter polarization beam displacer;

at least one reflector configured direct light from the first filter polarization beam displacer to the second filter polarization beam displacer;

a first output polarization beam displacer in optical communication with the birefringent filter assembly; and

a second output polarization beam displacer in optical communication with the first output polarization beam displacer.

2. The interleaver as recited in claim 1, wherein the reflector(s) comprise prisms.

3. The interleaver as recited in claim 1, wherein the reflector(s) comprise mirrors.

4. The interleaver as recited in claim 1, wherein the reflector(s) comprise two reflectors.

5. The interleaver as recited in claim 1, wherein:

the birefringent filter stage(s) define first and second paths;

the reflector(s) comprise a single prism; and

further comprising a material disposed in at least one of the first and second paths, the material having an index of refraction which causes the first and second paths to have different optical path lengths.

6. The interleaver as recited in claim 1, wherein each birefringent filter stage further comprises at least a half-wave waveplate intermediate each reflector and the first or the second filter polarization beam displacer.

7. The interleaver as recited in claim 1, wherein each birefringent filter stage further comprises at least a half-wave waveplate disposed intermediate each reflector and the first or the second filter polarization beam displacer, each half-wave waveplate having an optical axis thereof oriented at approximately 45° with respect to a +x axis at that location.

8. The interleaver as recited in claim 1, further comprising:

a first input half-wave waveplate disposed intermediate the input polarization beam displacer and the birefringent filter assembly and configured so as to transmit a non-displaced beam therethrough; and

a second input half-wave waveplate disposed intermediate the input polarization beam displacer and the birefringent filter assembly and configured so as to transmit a displaced beam therethrough.

9. The interleaver as recited in claim 1, further comprising:

a first input half-wave waveplate disposed intermediate the input polarization beam displacer and the birefringent filter assembly and configured so as to transmit a non-displaced beam therethrough, the first input half-wave waveplate having an optic axis thereof oriented at approximately 22.5° with respect to a +x axis at that location; and

a second input half-wave waveplate disposed intermediate the input polarization beam displacer and the birefringent filter assembly and configured so as to transmit a displaced beam therethrough, the second input half-wave waveplate having an optic axis thereof oriented at approximately -22.5° with respect to a +x axis at that location.

10. The interleaver as recited in claim 1, further comprising at least a half-wave waveplate configured to receive an output of each birefringent filter assembly.

11. The interleaver as recited in claim 1, further comprising a half-wave waveplate configured to receive an output of a birefringent filter assembly, the half-wave waveplate having an optical axis angle of approximately –22.5° with respect to the +x axis at that location.

12. The interleaver as recited in claim 1, further comprising:

a half-wave waveplate of a first stage thereof configured to receive an output of a birefringent filter assembly, the half-wave waveplate having a optical axis angle of approximately -33° with respect to the +x axis at that location; and

a half-wave waveplate of a second stage thereof configured to receive an output of a birefringent filter assembly, the half-wave waveplate having a optical axis angle of approximately 10.5° with respect to the +x axis at that location.

13. The interleaver as recited in claim 1, further comprising:

a half-wave waveplate of a first stage thereof configured to receive an output of a birefringent filter assembly, the half-wave waveplate having a optical axis angle of approximately -33° with respect to the +x axis at that location;

a half-wave waveplate of a second stage thereof configured to receive an output of a birefringent filter assembly, the half-wave waveplate having a optical axis angle of approximately 14° with respect to the +x axis at that location; and

a half-wave waveplate of a third stage thereof configured to receive an output of a birefringent filter assembly, the half-wave waveplate having a optical axis angle of approximately -3.5° with respect to the +x axis at that location.

14. The interleaver as recited in claim 1, further comprising:

a first half-wave waveplate disposed intermediate the first output polarization beam displacer and the second output polarization beam displacer;

a second half-wave waveplate disposed intermediate the first output polarization beam displacer and the second output polarization beam displacer;

a third half-wave waveplate disposed intermediate the first output polarization beam displacer and the second output polarization beam displacer; and

a fourth half-wave waveplate disposed intermediate the first output polarization beam displacer and the second output polarization beam displacer.

15. The interleaver as recited in claim 1, further comprising:

a first half-wave waveplate disposed intermediate the first output polarization beam displacer and the second output polarization beam displacer, the first half-wave waveplate having an optic axis orientation of approximately 0° with respect to the +x axis at that location;

a second half-wave waveplate disposed intermediate the first output polarization beam displacer and the second output polarization beam displacer, the second half-wave waveplate having an optic axis orientation of approximately 45° with respect to the +x axis of that location;

a third half-wave waveplate disposed intermediate the first output polarization beam displacer and the second output polarization beam displacer, the third half-wave waveplate having an optic axis orientation of approximately 45° with respect to the +x axis at that point; and

a fourth half-wave waveplate disposed intermediate the first output polarization beam displacer and the second output polarization beam displacer, the fourth half-wave waveplate having an optic axis orientation of approximately 90°.

16. The interleaver as recited in claim 1, wherein the birefringent filter assembly comprises one birefringent filter stage.

17. The interleaver as recited in claim 1, wherein the birefringent filter assembly comprises a plurality of birefringent filter stages.

18. The interleaver as recited in claim 1, wherein the birefringent filter assembly comprises two birefringent filter stages.

19. The interleaver as recited in claim 1, wherein the birefringent filter assembly comprises three birefringent filter stages.

20. The interleaver as recited in claim 1, wherein the filter polarization beam displacers and the reflector[s] of each birefringent filter stage define two light paths wherein a difference in the first and second optical path lengths is provided by a material having an index of refraction greater than one which is disposed within at least a portion of one of the first and second paths.

21. The interleaver as recited in claim 1, wherein the filter polarization beam displacers and the reflector[s] for each birefringent filter stage define two light paths wherein an index of refraction is different for at least a portion of the first and second paths, so as to cause the first and second paths to have different optical lengths.

22. The interleaver as recited in claim 1, wherein the input polarization beam displacer, the birefringent filter assembly, the first output polarization beam displacer and the second output polarization beam displacer are configured so as to facilitate interleaving of a plurality of beams simultaneously.

23. The interleaver as recited in claim 1, wherein the input polarization beam displacer, the birefringent filter assembly, the first output polarization beam displacer and the second output polarization beam displacer are configured so as to facilitate interleaving of a plurality of linearly arrayed beams simultaneously.

24. The interleaver as recited in claim 1, wherein the interleaver channels have spacing which is tunable.